Patterns of practice

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Patterns of practice: A reflection on the development of quantitative/mixed methodologies capturing everyday life related to water consumption in the United Kingdom

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Abstract

There is a growing body of research arguing the relevance of practice approaches to understand resource consumption, and to highlight alternative pathways to sustainability. These practice approaches offer an alternative conceptualisation of demand and have been demonstrated largely by qualitative research, particularly in the work on water and energy consumption in the home. However, these historical narratives and qualitative research have not, to date, lead to the development of quantitative or mixed methodologies that could potentially reflect the diversity of performances of practice across populations in a more systematic way. This paper reflects, critically, on one such attempt to scale a practice based perspective into a quantitative survey on water consumption and practice in homes in the south and south east of England. The use of quantitative and mixed methodology has substantial potential – from translating practice based research to policy; developing indictors to track patterns of practices as they change over time; and the exploration of methodologies that reflect the bundling and coordination of practices associated with water use inside and outside the home. The benefits and utility of such a methodological approach are highlighted, as are cautions and future research directions.

Keywords: everyday practice, practice theory, consumption, surveys, mixed methodology, water, cluster analysis

Introduction

There is a growing body of research that argues for the relevance of practice approaches and their emphasis on habit and routine for understanding resource consumption and the possibilities for sustainability (Halkier, Katz-Gerro, & Martens, 2011; Shove, 2010; Warde & Southerton, 2012). Practice approaches offer an alternative conceptualisation of demand, including studies of water resources management and water consumption (Chappells, et al., 2011; Gram-Hanssen, 2008, 2010, 2011; Hand, Shove, & Southerton, 2005; Medd & Chappells, 2007, 2008; Medd & Shove, 2006; Sharp, et al., 2011; Strengers, 2009, 2011b; Strengers & Maller, 2012; Trentmann, 2011; Trentmann & Taylor, 2006). This body of research demonstrates a rather more complex picture of the dynamics and distribution of demand compared to studies focused solely on attitudes, behaviour and active rational choice (Shove, 2010). Practice-oriented approaches tend to depict inconspicuous routine rather than attitudes as a main driver of resource consumption, the location of demand as inherently distributed across socio-technical networks rather than located in the individual, and the possibilities for intervention as concerning systems of provision and routines rather than manipulating attitudes and values. Further, practice oriented approaches emphasise the heterogeneity of performances at all levels of analysis and this directly challenges accepted (water) industry approaches to demand which presume the analytic proficiency of the 'average household' represented by an 'average' litres per day consumption rate.

However, despite these advances, a significant gap exists between these largely qualitative studies, and the kinds of quantitative evidence thought to be required for large scale strategic planning or policy formation by the stakeholders in these processes. There is therefore a major challenge: to scale up from historical narratives and qualitative accounts of the diversity of routines and habits to both challenge the current approaches to demand analysis, and provide alternative conceptual and methodological approaches that can be adopted in strategic planning as well as policy and business processes where, in short, numbers count. Beyond potential policy influences, there are a number of reasons for further developing quantitative approaches to study ‘practice’.

Much of the existing quantitative work on practices focus on the analysis of already existing data sets (e.g., Warde, Cheng, Olsen & Southerton, 2007 on time use data in homes; see also Browne et al., 2013a). Although these studies can express practices-as-entities shifting and changing over time and across different societies, other quantitative methodologies particularly survey and questionnaire approaches offer an opportunity to explore how these patterns of individual practices emerge and are performed within people’s homes at a population level. As such, this article reflects on what we believe is the first attempt to incorporate a ‘practices perspective’ into a quantitative survey methodology with a specific focus on a questionnaire developed to capture the diversity of practices

related to water use in the home. Exploring quantitative methodologies may also add to current analysis of existing quantitative data sets, by focusing on the patterns of performances, as well as potentially the bundling and coordination of practices.

Practice based research has been fairly successful in offering alternative conceptualisations of demand, highlighting the routines and habits of everyday life and the systems of provision that make water consumption in its multiple forms possible. This largely qualitative body of work has been quite powerful in the messages about the complexities of water use it has imparted particularly to the UK and Australian water industry (Medd & Chappells, 2008; Medd & Shove, 2006; Shove, 2003; Sofoulis, 2005, 2011; Strengers, 2011a; Strengers & Maller, 2012). We believe that this pragmatic and experimental approach to the development of practice based methodologies has the potential to significantly open up the methodologies used in studies of everyday practice, and contribute significantly in bringing a critical practice-based lens to policy and other locations of intervention and change for sustainable resource use in the UK and internationally.

In this paper we briefly reflect on the empirical work that has predominately been associated with the development of practice theory, and how this largely historical and qualitative research has provided a sound basis from which to explore more empirical and quantitative investigations. We then detail the development of the survey that attempted to capture the diversity of performances of those practices, encapsulating an idea of the 'images', 'skills' and 'stuff' associated with water use as well as temporality and seasonality. Using the example of bathing and showering we then move into a discussion of the utility of quantitative and mixed methods practices approach for understanding the current nature of water demand in the UK, using cluster analysis to identify common variants of practice across the population, and qualitative data to understand more deeply the nuances of the practice patterns observed. Finally we reflect on a number of sticking points in the development of quantitative practice based methodologies and potential future development.

Evolving a quantitative approach to capture everyday practice

Halkier et al (2011) acknowledge that out of the diverse theoretical literature on practices, only a few are grounded in empirically based reflections. Of those empirically based reflections, the body of practice research is still largely qualitative, although the range of potentially congruent quantitative methodologies available to practice-researchers is slowly starting to be recognised (e.g., the work of Browne et al., 2013a; Medd & Shove, 2006; Warde et al., 2007). Some theorists such as Pink (2012) advocate the development of methodologies that access practice as they are *performed* and observed. Others such as Hitchings (2012) concluded that 'people can talk about their practices' and reflect about their mundane habits and what influences these fairly intuitively and openly. He reflects

that these more traditional approaches to methodology should not be forsaken for the 'new and novel' observational methodologies (such as that advocated by Simpson, 2011; Spinney, 2009). While neither author advocates the superiority of the 'mono-method' (Onwuegbuzie & Leech, 2005) their perspectives still fairly reflect the privileging of qualitative methodologies in practice based research.

By focusing on the adoption of quantitative, questionnaire, and a mixed-methods approaches to data collection and analysis we advocate methodological pragmatism and pluralism (e.g., Alasuutari, 2009; Bryne, 2002; May, 2005; Onwuegbuzie & Leech, 2005; Payne, Williams, & Chamberlain, 2005; Platt, 2012; Poon, 2005; Williams, Payne, Hodgkinson, & Poade, 2008). One criticism of the current approach could be that using quantitative methodology is not ontologically or epistemologically consistent with theories of practice. We should always be cautious about combining ontological and epistemological 'chalk and cheese' (Blaikie, 1991; Hammersley, 2008; Shove, 2011)! However, although it may arguably require more vigilance maintaining a post-positivist approach while using quantitative methodology it is possible to use it in a way that enables description rather than causation (Uprichard, Burrows, & Byrne, 2008). Both qualitative and quantitative work can be pursued in a reflective and reflexive way that ensures the maintenance of ontological and epistemological congruency (Alvesson & Sköldberg, 2009).

Although there is not the room to explore emerging discussions on pragmatism and practice within this article (see., Callegaro, 2012; Fuller, in press; Gimmler, 2012) we believe that methodological pragmatism offers a different way of exploring practice focusing not just on 'what practices are' but also increasingly on how practices emerge and persist (e.g., Simpson, 2009). This is a key focus of this study, and fits with current theories to understand the dynamics of practice and change (e.g., Shove, Pantzar & Watson, 2012). We promote the idea of experimenting with quantitative methodologies to see whether they can capture practices in a meaningful way.

The distinction between practices-as-entities and performances is significant, particularly in understanding change (Shove et al., 2012). Practice-as-entity refers to a nexus of doings and sayings that evolve and disperse across space and time, for example, cooking and eating practices (Schatzki, 1996). Practice-as-performance refers to the 'doing' of practice through which practices-as-entities are changed or maintained, for example, the way a practitioner or group of practitioners 'do' cooking and eating. Much of the literature "takes practices to be enduring entities reproduced through recurrent performance" (Shove et al., 2012, p. 8). Although this is a largely simplistic definition, essentially it provides a platform for understanding how "the analytic distinction between practice-as-performances and practice-as-entity also proves useful, allowing us to show how novel combinations of competence, material, and meaning are enacted and reproduced" (p. 8). It is this analytic distinction between practice-as-entity and practice-as-performance that we have tried to develop in our research, and outline in this article.

Previous work using time use data can reflect upon the interconnecting bundles of household practices and how they change and shift over time and different societies (e.g., Warde et al., 2007). Our work first and foremost focuses on the concept of practice-as-performance, and the detail and patterns of these performances across a population in south east England as they were reported in the Summer of 2011. However, in reflecting upon the performances of individuals and their practices that relate to water in their homes, and using a cluster analysis to discern patterns in these performances we can say something about 'collective careers' of washing, gardening and laundry in people's homes in summer 2011. Obviously this represents a substantially different set of entities to washing, gardening, and laundry in 1960s, 80s or even noughties Britain (following the logic of Shove et al., 2012, p. 39). Although we can connect to previous historical and qualitative research to enhance the understanding of our results, due to the data being collected from what is called a 'one shot' data collection, we cannot directly comment on how practice entities have changed over time. However, this questionnaire data, reflecting as it does on (finding patterns amongst the) performance is a potential bridge between previous qualitative, ethnographic and observational data, and studies of large scale data sets such as time use data that reflect change over time. That is, although it reflects upon practice-as-performance, the population wide view also captures characteristics and features of practice-as-entity.

Capturing practices as performance and entity: Development of research questions and objectives for quantitative methodology

Overall, the purpose of the work was to develop understandings of the diversity of performances of practices associated with water use across the population in the South and South East of England and one of the main 'research questions' was methodologically experimental – can the diversity of water use patterns be *sufficiently* captured through quantitative survey methodology and with what conceptual, methodological and practical implications? Our interest was not therefore just in the performance of practices but following Shove et al (e.g., Shove & Pantzar, 2005; Shove et al 2012) also probing the elements that make up these practices including the infrastructures and technology, images and meanings for example of cleanliness and comfort, performance and skills associated with the practices, and attempting to identify where, when, how and why, these elements are likely to be sensitive to change. The intention was to use quantitative methodology and analysis as a tool to firstly reveal, quantify and then understand the diversity of practice across a population and secondly, to introduce a practice perspective to policy makers and the water industry in particular by effectively reframing the unit of their analysis from attitudes and behaviour to 'practices'.

Whilst ideally we would wish to conduct longitudinal mixed methodology studies to unpack the emergence, endurance and disappearance of practices as fairly lasting entities (Browne et al., 2013a; Shove, et al., 2012), scheduling and funding constraints necessitated a cross-sectional snapshot approach. However as the research unfolded it became clear that such quantitative snapshots can build upon, quite straightforwardly, previous work on the changing nature of practices-as-entity in the literature. For example, later we will show how we can use our quantitative results to compare with comprehensive historical accounts of the rise of the shower (Hand, et al., 2005; Shove, 2003; Trentmann, 2011; Trentmann & Taylor, 2006).

To capture the diversity of performances of practices associated with water in the home and garden we designed a survey-based instrument that was intended to reveal or capture the following dimensions:

- The heterogeneity of home/garden spaces and water infrastructures;
- The heterogeneity of water using technologies in households;
- The diversity of patterns of water using activities and practices that (currently) provide definition and structure to people's lives;
- The routines of cleanliness and comfort (laundry, washing), gardening and forms of pleasure (including drinking, eating) within homes;
- The current spatial and temporal dynamics and/or variability in people and households' embedded routines and habits;
- The diversity of practices related to different technologies in people's homes and gardens, and the cultural/social issues (e.g., images and meanings of cleanliness, comfort, convenience and the good life) shaping the performance of practice;
- Where relevant, the extent to which these practices relate to these different environmental signals such as temperature, sunshine and rainfall patterns (linked to the part of our project exploring the potential locations of change in practice associated with climate change).

We applied the above framing structure to create sets of questions based on a relatively simplistic division of the principle sites of water consumption and related practices in the home. The 'sites' of practice focused on washing (bathing and showering, flannel use, religious washing etc), laundry, gardening, kitchen use (food preparation and dishes) and car washing because these are familiar taxonomies for water policymakers and also because they should 'make sense' to UK respondents (Medd & Shove, 2006). To briefly explain the process a large exhaustive list of questions was generated by the primary author and colleagues. This was then substantially edited with various colleagues internal and external to the project, and subsequently involved the market research team

contracted for the implementation of the questionnaire testing the original list of questions to ensure clarity to a wider audience and pretesting with a pilot group.

This final list was by no means a stand-alone, definitive guide to quantitative questionnaires on water and everyday practice! In a traditional 'behavioural' survey you would have multiple iterations of questions testing and validating the same 'construct' – with survey the most we could manage was one variation of the same styles of question for each site of practice. Therefore, further work would need to be done to test whether these structures of questions were the most effective in capturing the various elements of practice. Most of the questions were highly experimental in how they were worded, and it was a test to see how well the analysis of these questions actually captured various aspects of 'practice. In summary, for each of these principle sites of practice in which water use was implicated the survey attempted to uncover:

- The diversity of these performances of practices across a population (descriptive analysis);
- Any common variants in performance that could be identified in the population (cluster analysis);
- The associated characteristics of these practices (associated technologies, meanings, temporality, seasonality, etc);
- Links with any potential socio-demographic variables (e.g., age, gender, ethnicity, house ownership and type).

Questions were designed to capture the frequency with which the practice was performed, the technology used and variation in the performance of the practice in time or by context. Building on the theoretical distinction between practices as entities (codified as a set of survey items) and practices as performances (codified as survey response options), these 'dimensions' of the performance of practice were then used to identify *common variants of practice*, such that respondents within each variant have similar values on those dimensions, and hence perform the practice in a similar way, measured along those dimensions. To do this we employed cluster analysis (Aldenderfer & Blashfield, 1984), a familiar technique which has previously been used in sociology to understand features of practice of water users, based on archival data micro-component[2] data from

[2] Micro-component data is gathered by putting a 'logging' device on each water using infrastructure or technology in the home. This data logs the volume of water consumed at each point of use of these infrastructures and technologies over various time periods. This data reveals consumption in total volumes consumed (and when), but it does not generally give an indication as to what the technology infrastructure is being used for (e.g., whether a sink is being used to wash vegetables or to wash hands or hand washed laundry), nor any detailed picture of the routines and habits of the household.

Anglian Water (Medd & Shove, 2006) and more widely in both academic and applied consumer research (e.g., Holttinen, 2010; Punj & Stewart, 1983; Vyncke, 2002). This analysis was done, not with the intention of modelling and categorising water using properties of common household segments based on socio-demographics or other household and individual characteristics (eg, DEFRA, 2008), but to identify whether any of the elements of practice bundle together in any apparently coherent way across households.

Of course a quantitative approach will inevitably lead to a more partial understanding of what other things (such as work and leisure routines) are shaping the nuanced aspects of practice, and it is obviously reliant on reported behaviour rather than an observation of the actual performance of those practices. In our empirical research we therefore supplemented the survey work with 'practice based talk' (Hitchings, 2012) to reveal the breadth of diversity and the depths of meaning associated with performing practices. To do this we conducted follow up interviews with a number of participants who had participated in the survey to discuss in depth the practices they enacted in daily life that then shaped water use in the home, and other spaces. In what follows we use this data to flesh out the 'practice clusters' derived from the survey data directly.

Clustering practice: The utility of a practices approach for understanding the diversity of demand

A detailed description of our research method can be found elsewhere (Pullinger, et al., 2013) but briefly the sample of 1802 respondents was constructed in two stages. The first sample was randomly selected from the Government Office Regions of the South, East and South East of England to provide a *random sample representative* of those three regions with a regional sample size proportional to the population size in each. The second was an identical survey administered to randomly selected households within specific *case study areas* of those Government Office Regions where our collaborating water companies were able to provide area-based metering penetration figures and (household) water consumption data for some of the households through their own monitoring systems. Overall the stage one survey produced a main sample of 997 responses with an additional stage two of 805 case study responses. The contracted fieldwork agency produced non-response weights to correct for non-response bias in both the main and case study samples and the samples are analysed together as one sample using these weights in the analyses in this paper. A fieldwork pilot took place in May/June 2011 and the fieldwork period when the 1,802 interviews were completed was between the 13th June and 8th September 2011. In the following sections we provide an overview of a small portion of the results focussing in particular on practices of washing, shaving and bathing. Similar analyses have been conducted for laundry, kitchen and gardening practices (reported in Pullinger, et al., 2013).

Descriptive analyses of washing, showering and bathing

Although the data reflect only one collection period and therefore do not reflect change over time our results suggest that showering has now replaced bathing and flannel washing as a way to get clean, to relax and so on; and reflecting on the results of previous studies supports that the frequency of has altered over time (e.g., Hand et al., 2005; Shove, 2003). Overall in the population, nearly three quarters have a bath or shower at least daily and showering is the most popular way of having a full body wash – 50% of respondents never have a bath, compared to just 17% who never have a shower. For most of those who do have baths, it is combined with showering, and is an occasional event. Among those who only have baths, and no showers, the majority have one about daily (see Figure 1 for the different distributions of weekly washing, bathing and showering across the population). The survey also asked about other forms of washing, such as flannel washing. Only 29% of people have a flannel or similar wash at all, although among those who do, two thirds do so at least 7 times a week. 75% of those who flannel wash at least seven times a week also take a bath or a shower at least seven times a week – they are clearly complementary practices for most people, rather than being alternative forms of washing.

Cluster analysis of washing, showering and bathing

In this section we will briefly present an example of the cluster analysis that emerged for showering and bathing; an analysis that led to the selection of six quite distinct groups of 'washing practices'. Without opening up the debate, 'what is a practice', washing is used to express various aspects of personal care and could be defined as the 'entity' which is 'performed' in various complexes and bundles and performances of showering, bathing, flannel washing, shaving, washing hair, ritual washing and so on. A detailed description of the methodology of cluster analysis, the decision points for dimensions from the survey that were used for the cluster analysis, and other rationalisations for the analysis are contained in detail in our report (Pullinger et al., 2013). Briefly, however, there were five dimensions that were selected to perform the 'clustering' – frequency (how often is the practice performed); diversity (how much does the performance vary for a given respondent between performances); technology (how much or which technologies are used in the performance of practice); outsourcing (is the practice performed or outsourced outside of the home); and efficiency (how is water used in the performance of each practice)[3]. Each of these dimensions

[3] Note that the names given to these dimensions are intended to be purely descriptive, and are not intended to convey any normative value judgement regarding which ways of performing a practice are ''better'' or

could be standardised across the sites of practice surveyed so that the clusters that emerged were statistically comparable. Factors that reflect individual performance (such as time as the day, reasons given for variations in performance of a practice) were not included in the cluster analysis but correlated with the clusters. This was due to cluster analysis needing to use dimensions based on scaled data, and that adding many more dimensions to the analyses was found to produce overly large numbers of clusters which reduced their explanatory power.

By far the largest variation of washing practices arising from the cluster analysis is '*Simple Daily Showering'*, performed by almost 40% of the population. The characteristics of this variation of washing are fairly simple - the performance involves washing usually every day, sometimes more (and occasionally just six times per week), and usually only showers. Shower length or bath water level is rarely changed for any particular reason, and showers are never taken outside of the home. This cluster appears to be a variant of practice where the daily shower is just the 'done thing', performed out of habit as the accepted, and most convenient, way to stay clean and fresh. Brushing teeth twice a day is also the norm, slightly more so than for the rest of the population (89% vs 80% do so).

The next two groups in size, both representing about 15% of the population each, are *'Out and About Showering'* and *'Attentive Cleaning'.* Out and About Showering differs from Simple Daily Showering primarily in that showers or baths are also taken outside of the home, particularly at the gym, where two thirds shower (compared to just 5% of the rest of the population), and at a friend's, family or partner's place (38% compared to 4%). Washing tends to happen more than once daily, and legs and arms are more likely to be shaved for women. The characteristics of recruits to Out and About Showering are that they are likely to be substantially younger on average than the rest of the population, more likely in full time work, and more likely male. Attentive Cleaning meanwhile is rarely ever performed outside the home, but people in this cluster are likely to have 8 or more showers or baths per week. The proportion of baths and showers is varied, with a fair share of baths, and a variety in the length of the bath for a wider range of reasons suggesting care with washing and grooming. Both men and women are substantially more likely to shave their body, particularly under arms and legs for men (41% and 22% do, respectively, compared to 17% and 13% in the rest of the population). The 'metrosexual' stereotype and lifestyle would seem to fit in this group linked to both heterosexual and homosexual masculinities and the rising incidence of male depilation (Boroughs,

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''worse''. In particular, the term efficiency is used purely to indicate whether the amount of water used in the performance of a practice could be higher or lower than it is, if other dimensions are controlled for. Different efficiency levels may not even be functionally equivalent in all cases – in the case of kitchen practices for example, efficiency refers to whether the respondent leaves the tap running before drawing water, for rinsing plates, or for other purposes – whilst not running the tap is allocated a higher efficiency score, in some instances (such as if the respondent has lead pipes), doing this can be seen as serving an important function (ensuring the water to be drunk contains as little lead as possible).

Cafri, & Thompson, 2005; Pompper, 2010; Shugart, 2008). People with children are also more likely to be recruits to Attentive Cleaning. In short, both these groups seem to be young and socially and/or physically active, with water intensive washing practices, perhaps representing rising new variants of personal care.

Two smaller clusters are '*Low Frequency Shower*ing' and '*Low Frequency Bathing'*, at 12% and 7% of the population respectively, both averaging about 4 baths or showers per week, but often fewer, with the first group usually only having showers, the other almost always just having baths. Recruits are markedly older than average and more likely to be retired. These groups could represent variants of washing that have been carried by the members of this group for years – echoes and traces of an era where once daily or more showering was not a common practice (Hand, et al., 2005). One can question whether the patterns of practice that represent these two smaller low frequency washing groups will be transmitted to younger generations, or disappear altogether.

The final group is '*High Frequency Bathing'*, characterised by a mostly daily bath, but almost never a shower. There is a suggestion in the data that this might be simply because a shower is not available and there are restrictions on getting one installed. People performing High Frequency Bathing are more likely to be less affluent than average, unemployed, and to be renting, all identified by Waterwise to be 'barriers' to installing showering technology in the home (Waterwise, 2009). How people bathe varies strongly age, Figure 2 shows the variation in the proportions of each age band which can be found in each cluster.

Blending quantitative and qualitative data to capture the nuance of practice

As mentioned previously we conducted face-to-face unstructured interviews with a sub-sample of survey respondents. It was then identified which of the clusters these interview participants belonged to for each site of practice, and the interviews could then be used to explore the relationship between quantitative and qualitative responses. Although we do not have space in this paper to fully explore the information from this in-depth fieldwork, we highlight below the potential benefit of a mixed methods approach in providing detail and narrative to cluster analysis.

Eliza is a 45-54 year old housewife who lives in a semi-detached house with a large garden in northern London with her husband (45-54), which they own outright and share (occasionally) with their two daughters who are at university. In the survey Eliza said that she showered 2 times a week, and flannel washed 7 times a week. In the survey she reported that the shower is used to get clean, because it's quick, after sport, and to cool down, and that she uses the flannel wash simply to 'get clean'. She was identified as belonging to the *Low Frequency Showering* group in the cluster analysis reflected in her early comments about bathing:

> *Eliza:* I'd say for me personally, I probably have more baths now because my children are grown up so I have more leisure time [laughs] and I consider a bath as a leisure activity whereas having a shower is what you do to get clean. […] *Interviewer:* So do you have a shower every day? *Eliza:* no, not necessarily. Every couple of days or whatever; it depends what I've been doing. The thing that changes, ah.... well obviously the heat makes a massive amount of difference, because you get really sweaty and things. And to be honest when it is cold you don't particularly feel like having a shower in this house because it is quite a cold house. Ummm and also obviously what you have been doing. We do loads of gardening and you get absolutely filthy when you come out of the garden or if you've been exercising. Occasionally I will get dragged on a cycle ride or go for a long walk; or even to be honest if you have been to London on the tube then you feel really awful when you get home. […] *Interviewer*: so did you used to work in London or do you still work in London? *Eliza*: I did yes *Interviewer*: when you had that regular commute in, were your habits different such as did you shower more? *Eliza*: my entire lifestyle was different so yes. I probably washed much more because when I was working you have to make yourself look presentable for going to work etc. Now, if I am just spending my day in the garden or going to Sainsburys then I don't really care that much so you don't need to worry about washing your hair!

As the example shows, Eliza could reflect qualitatively on how her practices had changed over time as a function of retirement; changing work and leisure practices; changing ideas of what it was to be 'presentable'; changing travel patterns (no longer catching commuter trains and tubes into London); and having children who are grown up and rarely home and more time to relax. These were all issues we failed to capture in the quantitative data due to restrictions in the length of the survey. She also revealed in the interview that she actually enjoys a weekly bath which was not revealed in her quantitative survey responses. From the integration of the qualitative and quantitative data in this example, it is possible to speculate on the potential change from Simple Daily Showering to Low Frequency Showering across a washing practitioners life course (Shove, et al., 2012).

Discussion: Implications of quantitative and mixed method approaches to understand practice

This cluster analysis of washing practices shows the impact of changing a unit of analysis from one focused on individual's attitudes and behaviour and relying on the at least conceptual existence of an 'average consumer', to one of capturing and analysing the unit of analysis as *performed social practices*. Rather than clustering and segmenting based on household characteristics as is generally the case in the kind of customer segmentation (DEFRA, 2008; Waterwise, 2011), this analysis has allowed for the emergence of a range of patterns of washing practices which our analyses have shown are not well-defined by attitudes, values and demographics (Pullinger et al, 2013). This is not

to say that these clusters represent the complete nature of complexity and diversity of performance of practices in a population, nor do we assert that these categories will remain consistent or static over time (Pink, 2012; Shove, et al., 2012). Rather we suggest that they are seen as descriptive analyses that can be used as useful tools for communicating a practice approach to stakeholders and opening up possibilities for understanding social change, and intervention. The age profiles of the different clusters (Figure 2), and the qualitative data of 'Eliza' discussed above, indicate the potential for 'performances' of practices to change over time (e.g., one's performance of particular practices associated with cleanliness may change throughout a life course), and the change in the maintenance and disappearance of practices-as-entities across generations such as the potential for low frequency, low intensity cleanliness practices slowly disappearing from the UK.

The cluster analysis has demonstrated that patterns of washing fall into distinct variants in the sample population. Bathing seems to be almost extinct as an approach to cleanliness, people having baths often only when constrained to do so (High Frequency Bathing), or when it is part of a particularly attentive cleaning and pampering regime (Attentive Cleaning). These clusters of practice also reveal both the potential for understanding change and intervention at the level of practices-as-performance, and practices-as-entity. New hyper-vigilant variants of bodily cleanliness practices might be emerging, particularly in terms of washing frequency and the attention paid to personal grooming and care.

This leads to some direct policy relevant questions. Both Out and About Showering and Simple Daily Showering reflect groups that wash with a similar frequency, just in different locations. Therefore, does Out and About Showering a) reflect simply a younger demographic of socially mobile people who may be recruited into Simple Daily Showering throughout their lifecourse or b) that active, sporty, and social lifestyles are on the rise across all demographic groups, and that Out and About Showering may become a more common variant of practice in the future? In association with Out and About Showering specifically, interventions to improve gym and work shower water efficiency would be relevant, as would re-introducing alternatives to showering as a way to get clean such as flannel washing and small 'splash' baths, or even more effective antiperspirant deodorants which all may be less water intensive (eg, Doyle & Davies, 2012; Kuijer & De Jong, 2011, 2012; Kuijer, McHardy, & Scott, 2010)! Additionally, will Attentive Cleaning practitioners remain 'committed' to a professional and social identity which involves regularly committing time to be being clean and refreshed beyond that required by the 'normal' daily showering? Is this indeed a variant of washing and self-care that is on the rise?

As reflected earlier in the article, maintaining a postpositivist approach where the quantitative analysis enables description rather than ideas of causation (Uprichard et al., 2008), and ontologogical and epistemological congruency (Alvesson & Sköldberg, 2009) with practice theory is a key challenge

for the development of quantitative and mixed methodological studies in this field of inquiry. Even maintaining the language of practice theories, amongst the language of 'factors', 'correlations', 'dimensions', 'statistical significance', and our needing to exclude certain questions (e.g., meaning) from the cluster analysis because they are not representable on a 'scale' causes a few headaches! It has required constant vigilance of ourselves, our close and trusted colleagues, and even the two helpful IJSRM reviewers to identify where we have 'slipped' back into the language of positivism, and behaviourism associated with quantitative methodologies.

This issue of the language, and assumptions of the nature of reality, in quantitative analysis is particularly true when we consider taking this approach forward to the policy makers, and water industry who we feel will significantly benefit from a reframing of their unit of analysis from 'behaviour' to 'practice'. That is a concern is that rather than being seen as a descriptive tool the clusters could be misconstrued as having an ontological reality that is as actually existing as fixed categories when being communicated, and ideally used, in these sectors. This could result in a situation where our approach, which is attempting to provide a critical narrative to the idea of the 'average consumer' is merely integrated into the knowledge production of the 'other' approach (Shove, 2011; Shove, 2010, 2011; Whitmarsh, O'Neill, & Lorenzoni, 2011; Wilson & Chatterton, 2011). For example, a naïve reading of our results might suggest that we believe that 6 clusters of washing practices actually exist, not that we see them as descriptive tools embedded in a conceptual perspective that acknowledges the emergence, maintenance and retirement of systems of provision and practice across space and time.

Indeed, by focusing the unit of analysis on the performance of practices in the household (with a few references to systems of provision outside of the home, or connected to the home but not a focus of the analysis) one risk is that our research will simply become a substitute for an approach to customer demand based on individual demographics and individual and household characteristics of practice and lifestyle). However our analysis of the limited linked household water usage data that we have indicates the futility of taking this approach as each variant of practice generally has both high and low water users and our results suggest traditional demographic data (which is usually used for targeting interventions) is not a major predictive factor for most of the clusters for washing, laundry and gardening (Pullinger et al., 2013), except for age in relation to variants of washing (Figure 2).

Similarly, whilst the household can be a useful location for analysis because it is considered the locale of specific performances of practice associated with water, taking the household strictly as the location of analysis also covers up water use in other places (such as with the Out and About Showering group). As such although we were conducting interviews with individuals from households, we attempted to treat the unit of analysis as reaching beyond the individual/household to the wider practices that constitute the socio-technical network of distributed water demand.

Therefore, the significant point in policy translation and business application of this research approach will be to some extent to disappear water and demography, to focus on the services that water, which can be achieved by trying to not let go of the *practice* as the unit of analysis.

Conclusions: Ways forward for the use of quantitative methodologies for practice

This research attempted, in a pragmatic way, to use quantitative methodology as a way to both critique the dominant approach of policy and business stakeholders to demand analysis in the water industry in the UK, and attempted to develop viable working alternatives to these dominant economic and psychological approaches. This methodological experimentation obviously comes with caveats and cautions that we have highlighted in the previous section We have argued however that through such methodological experimentation a whole new toolkit with which to explore 'practice' could come into play, as well as further developing our ability to track changes to practice over time (see Browne et al., 2013a for more detail). As well as the methodological benefits these quantitative and mixed method approaches can provide valuable practice oriented insights for policy and business purposes (Browne et al., 2013b; Holttinen, 2010), as well as providing a strong contribution to current theoretical developments of understanding the practices and particularly how they change. In addition to enhancing the understanding of the diversity of the performances of practices expressed throughout a population, through the clusters of practice that emerged from the analysis, we were able to make some more significant comments regarding the potential locations of change to water consumption relating to both life course (changes to performance of practice 'carriers') and generational change as elements of practices disappear, emerge or are remade in relation to changing socio-technical and other conditions (evidence of shifting entities of practice).

Despite the identified limitations of this approach, we feel that there is now an significant opportunity to undertake research exploring the utility of this clusters of practice approach in providing a useful framework for social change and intervention associated with various forms of (sustainable) consumption (food, energy etc). In summary, this paper reports on and advocates a sense of methodological experimentation in the study of practices by incorporating more quantitative, questionnaire, and mixed methodologies. Particular in studies focused on household practices of water and energy the time is right to build upon existing historical and qualitative data to not only push the boundaries of theoretical development, but to further promote the value of using 'practices' as a way to understand and influence UK and international sustainable consumption policy agendas.

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Figure 1 Percentages of respondents reporting different showering and bathing frequencies

n = 1802, weighted by respondent

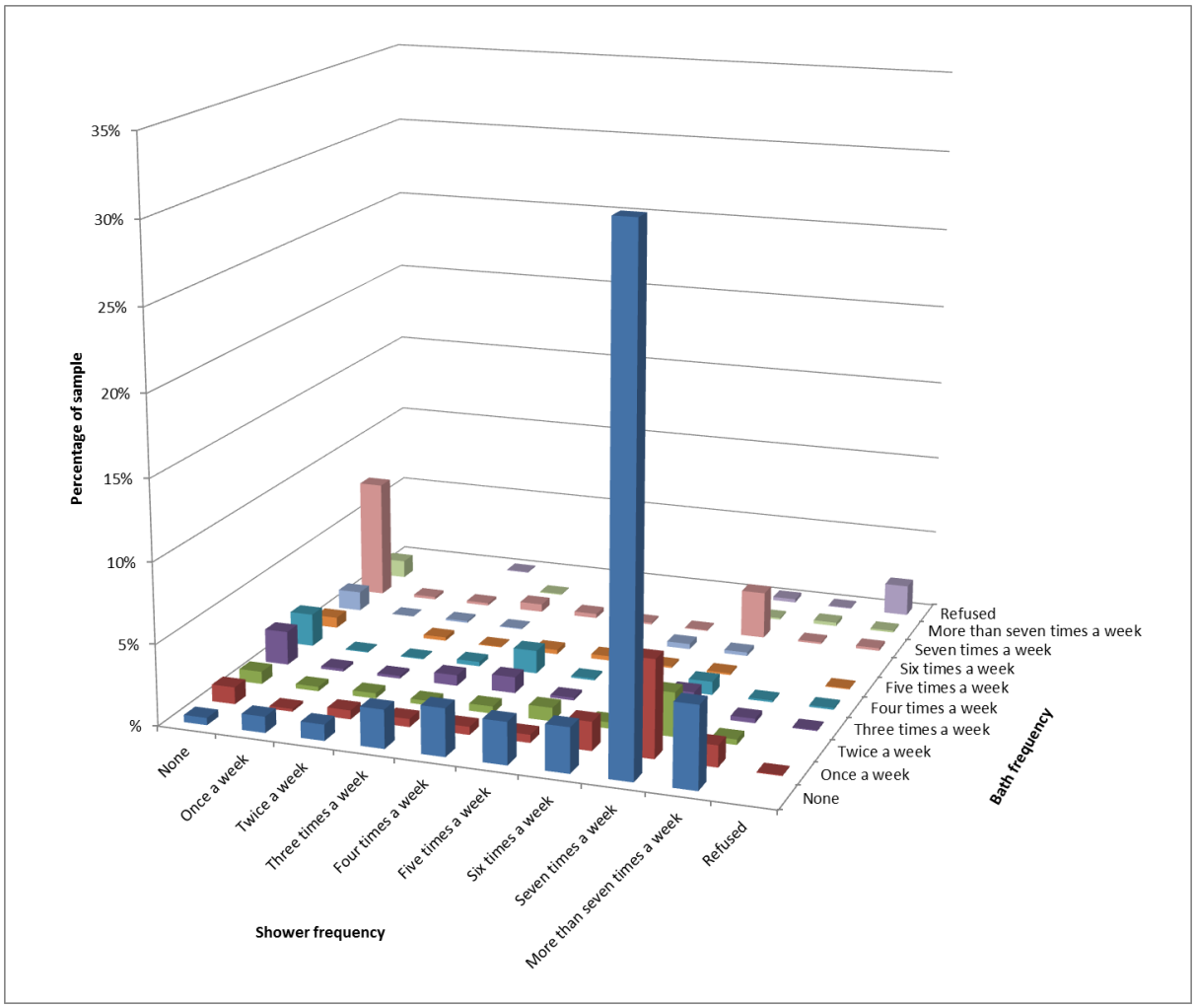
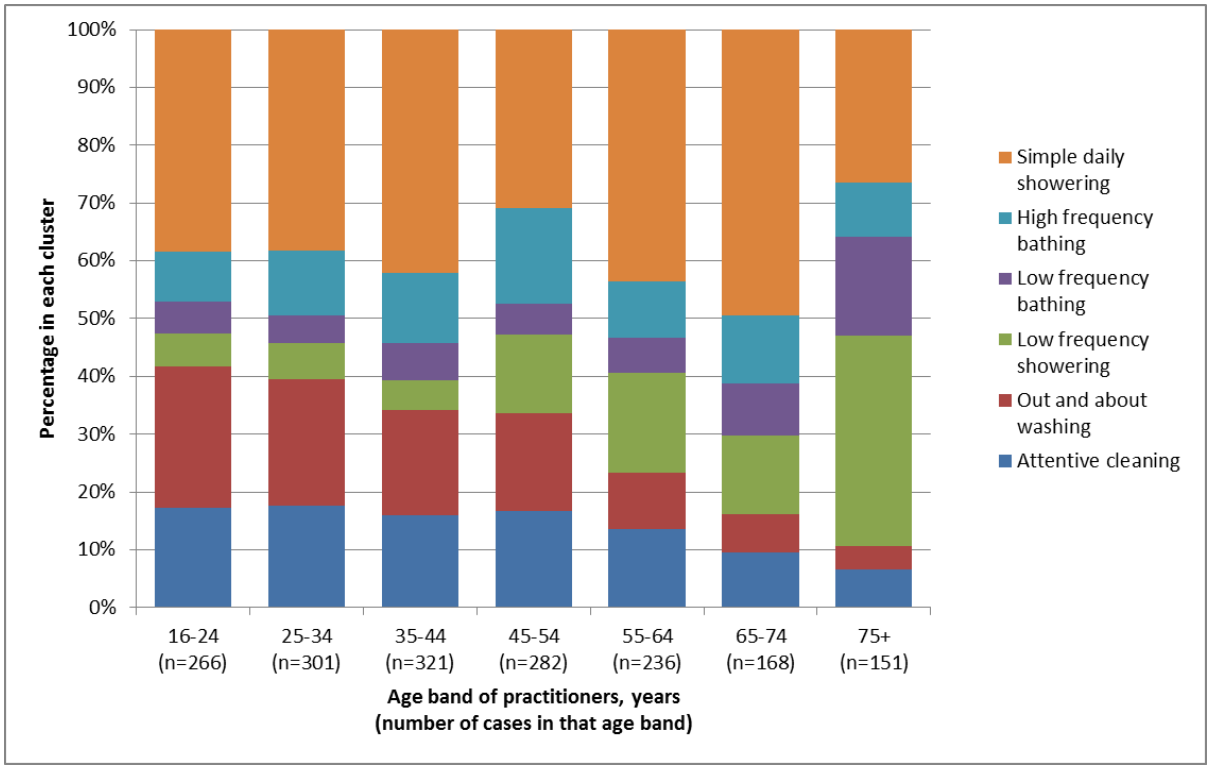


Figure 2 Variation in percentages of cluster membership by age n = 1725, weighted by respondent



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